

REMARKS

Claims 1-11 are all the claims pending in the application.

The Examiner rejects claims 9-10 under 35 U.S.C. § 102(e) as being anticipated by, and claims 1-3, 7 and 11 under 35 U.S.C. § 103 (a) as being unpatentable over, Martens et al. (Martens). The Examiner again indicates that the dependent **claims 4-6 and 8 would be allowable** if rewritten in independent form including all of the limitations of their base claim and any intervening claims.

Applicant rewrites claims 4-6 and 8 in independent form including the limitations of the original base claim and any intervening claims. Therefore, claims 4-6 and 8 should now be allowed. These amendments do not change the scope of the original claims 4-6 and 8, but merely present these claims in independent form. No estoppel is created.

Also, applicant amends claim 1 explicitly to recite the definition of “the feature vector”, as described in Applicant’s specification at, for example, page 9.

With regard to the Examiner’s prior art rejections, the Examiner relies on the same reference as in the previous Office Action, but has now revised his reading of this references based on the arguments presented in the Amendment filed March 12, 2004. In particular, instead of alleging that claims 1-3 are anticipated by (i.e., are readable on) Martens, the Examiner now alleges that claims 1-3 would have been obvious from Martens. In support of these new grounds of rejections, the Examiner alleges that:

- with regard to independent **Claim 9**, Martens discloses: “determining an activity model, which maximizes the probability between activity models and video frame using a transition matrix for the determine state, as the recognized activity” (see Office Action, page 3 citing Martens, Abstract; col. 13, lines 59-67; and col. 14, lines 1-12); and

- with regard to independent *Claim 1*, Martens teaches: “estimating the probability distribution of the feature vector for a plurality of video frames”, which would make it obvious to one of ordinary skill in the art to “determine the probability distribution ...” (see Office Action, pages 3 and 4, *original emphasis*, citing Martens, Fig. 7 and col. 18, lines 49-61).

Applicant respectfully disagrees with the Examiner’s latest analysis, and traverses these prior art rejections as follows.

As explained by Applicant’s previous Amendment filed March 12, 2004, one aspect of Applicant’s claimed invention provides an object activity modeling method comprising unique combinations of method steps including, *inter alia*,

- (a) obtaining an optical flow vector from a video sequence;
- (b) obtaining the probability distribution of the feature vector for a plurality of video frames, using the optical flow vector;
- (c) modeling states, using the probability distribution of the feature vector; and
- (d) expressing the activity of the object in the video sequence based on state transition

(Applicant’s independent claim 1).

The feature vector is an $d \times L$ dimensional vector, d being a number of dimensions and L being a number of pixels in a video frame or in a region of interest, as further defined in the amended claim 1.

Another aspect of Applicant’s claimed invention provides an object activity recognition method comprising unique combinations of method steps including, *inter alia*,

- (a) obtaining feature vectors by motion estimation for video frames;
- (b) determining a state, to which each frame belongs, using the obtained feature vectors; and

(c) determining an activity model, which maximizes the probability between activity models and a video frame provided from a given activity model dictionary using a transition matrix for the determined state, as the recognized activity

(Applicant's independent claim 9).

As explained in great detail in Applicant's previous Amendment, Martens does not disclose, teach or suggest such unique combinations of method steps.

With regard to claim 1, nowhere does Martens disclose, teach or suggest at least the step of obtaining a probability distribution of a feature vector for a plurality of video frames, using the optical flow vector, wherein the feature vector is an $d \times L$ dimensional vector, d being a number of dimensions and L being a number of pixels in a video frame or in a region of interest.

Martens' disclosure at col. 18, lines 49-61 (relied on by the Examiner) is reproduced below in its entirety:

Once the scores t_n Hyp₂ = t_n has been estimated, then generate hypothesis x_n Hyp₂, e.g.

$$x_n \text{ HYP}_2 = t_n \text{ Hyp}_2 * P^T$$

Generate also a simplified estimate of the statistical probability distribution of this hypothesis point estimate, as outlined in FIG. 7, resulting in Hypothesis Impact Measures: Pixels with particularly high pixel leverage, $\text{diag}(P(P^T P)^{-1} P^T)$ and/or frame leverage, $\text{diag}(T(T^T T)^{-1} T^T)$, and/or abnormal bilinear residuals E or decoding intensity errors DI , are given higher uncertainty than the other pixels. These uncertainties form the basis for computing the various Hypothesis Impact Measures which define how the point estimate $x_n \text{ HYP}_2$ is applied in subsequent motion estimation. In the preferred embodiment, the higher uncertainty of a pixel in a hypothesis, the lower is its strength 750 and the smaller is its Shift Range 730 and Propagation Range 740.

(Id.).

While Martens describes generation of a “simplified estimate of the statistical probability distribution” of its hypothesis point estimate, Martens does not in any way teach, or even remotely suggest, obtaining a probability distribution of a feature vector for a plurality of video frames, using the optical flow vector, as claimed in claim 1.

With regard to claim 9, nowhere does Martens disclose, teach or suggest the step of determining an activity model, which maximizes the probability between activity models and a video frame provided from a given activity model dictionary using a transition matrix for the determined state, as the recognized activity.

As explained in detail in Applicant’s previous Amendment, Martens’ “bilinear prediction hypothesis” has nothing to do with “obtaining the probability distribution ...”, as claimed in Applicant’s claim 1, or “determining an activity model, which maximizes the probability ...”, as claimed in Applicant’s claim 9. That is, Martens explicitly discloses that “Hypothesis Reflects the Assumed Probability Distribution of the Expected Result” (see Id. col. 12, lines 58 and 59, emphasis added). Clearly, “assuming” the probability distribution does not suggest, and is quite contrary to determining a model, which maximizes the probability, as required by Applicant’s claim 9.

The Examiner cites Martens’ abstract in support of his rejection. However, the general description of a proposed motion estimation technique set forth in Martens’ abstract does not bolster the Examiner’s position because no mention is made of any maximization, let alone maximization of the probability, as recited in Applicant’s claim 9. Martens’ disclosure at col.

13, line 59 through col., 14, line 12, (also relied on by the Examiner) is reproduced below in its entirety:

The multifactor linear or bilinear modelling of allowed intensity change patterns provides a flexible, yet simple enough summary of the systematic intensity changes that do not appear to be due to motion. This is particularly so, if the intensity change loadings are known or have been estimated a priori, so that the probability of erroneously modelling motion effects in the intensity domain is minimized.

Similarly, multifactor linear or bilinear modelling of depth, transparency or classification probability can enhance the motion estimation and modelling, by correcting for systematic changes that would otherwise impede the motion estimation. But if allowed too much flexibility, adaptive correction in these alternative domains can destroy the motion estimation. Therefore such multidomain modelling must be done with restraint: only clearly valid change patterns must be included in the multidomain models. These constraints can be relaxed during iterative processes as the bilinear models become less and less uncertain.

The use of bilinear multidomain modelling in conjunction with motion estimation is described in more detail in the Fifth and Sixth Preferred Embodiments.

(Id.)

While Martens describes “multifactor linear or bilinear modelling [“with restraint”] of depth, transparency or classification probability”, Martens does not in any way disclose, teach, or even remotely suggest, determining an activity model, which maximizes the probability between activity models and a video frame, as claimed in claim 9.

Therefore, Applicant’s independent claims 1 and 9, as well as the dependent claims 2, 3, 7, 10 and 11 (which incorporate all the novel and unobvious features of their respective base claims), are not anticipated by, and would not have been obvious from, Martens at least for these reason.

AMENDMENT UNDER 37 C.F.R. § 1.111
Appln. No.: 09/916,210

Atty Dk. No. Q61834

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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